Blue phosphorescent OLED with interfacial mixed layer in the presence of various ETL materials

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In recent years, many interests in phosphorescent organic light emitting devices (PHOLEDs) have resulted in a number of studies and developments for much better performances [1]. There have been much efforts to enhance the luminous efficiency of blue PHOLEDs by using various emitting materials and ~~by~~ adapting new device structures [2-3]

In this study, we will discuss some of the important device parameters affecting the efficiency in devices with interfacial mixed layer(IML), because the effect of IML cannot be verified concretely only based on materials. TPBi, 3TPYMB and TmPyPb were selected as ETL materials with different electrical characteristics following the LUMO energy level, hole blocking barrier based on HOMO energy level, triplet energy level, and electron mobility. To investigate how the efficiency of devices with IML is affected by each property, blue PHOLEDs without IML and with IML were fabricated. The structure of blue PHOLED device with IML is ITO/NPB/mCP:FIrpic-8%/IML/ETLs/Liq/Al in which devices A1, B1 and C1 do not include IML whereas devices A2, B2 and C2 do mCP:FIrpic-8%:TPBi, mCP:FIrpic-8%:3TPYMB and mCP:FIrpic-8%:TmPyPb, respectively. IML was fabricated by co-evaporation of mCP and ETL materials by 1:1 ratio. Current densities of the devices with IML improved compared to the devices without IML because the electrons of ETL molecules were not only accumulated but also can be readily moved to ETL materials in EML owing to the electron transition between the same molecules.

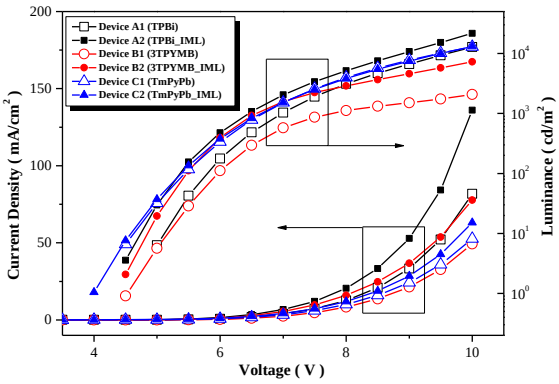

Fig. 1. J-V-L characteristics of blue PHOLED with IML

Blue PHOLEDs were fabricated so that their electrical performance can be observed using interfacial mixed layer (IML) which consists of various ETL materials between EML and ETL. The current density and luminous efficiency of blue PHOLEDs with IML significantly improved 19% but the color coordinates did not changed compared to reference devices without additional materials or functional layers.

References

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